



# PATENT SPECIFICATION

DRAWINGS ATTACHED

868,244

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Index at acceptance:—Class 64(3), S4(E:F).

International Classification:—F25h.

## COMPLETE SPECIFICATION

### Heat Exchanger

We, THE AIR PREHEATER CORPORATION, a corporation organized and existing under the laws of the State of New York, United States of America, located at 60 East 42nd Street, New York 17, State of New York, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to improvements in plate type heat exchange apparatus utilized for the transmission of heat between confined fluids, and particularly it relates to an improved extended surface arrangement that greatly increases the transfer of heat between fluids on opposite sides of a passage wall in such heat exchange apparatus.

A well known form of heat exchange apparatus for the transfer of heat between two confined fluids comprises a plurality of spaced metallic plates forming passages through alternate ones of which a heating fluid flows in heat exchange relation with a fluid to be heated, the fluid to be heated traversing the intermediate passages. In many such heat exchangers a series of "envelopes" consisting of parallel plates with the space therebetween closed along one pair of opposite edges are provided. The envelopes are mounted in spaced parallel relation to form passages for another fluid and the inter-envelope spaces are similarly closed along one pair of opposite edges to restrict the fluid to the space therebetween.

To increase the efficiency of heat transfer between the two fluids that are spaced apart by the passage walls, the latter may be provided with extended surface in the form of pins or other surfaces that project into the fluid streams. In most cases the extended surface has been difficult to fabricate, and generally the extended surface then provided has been inefficient or insufficient to satisfy the demands of the conditions involved.

Therefore, an object of the present invention is to provide an improved extended surface arrangement for a plate type heat exchanger that is efficient, adequate, and easily produced to satisfy various conditions.

The invention will be best understood upon consideration of the following detailed description of an illustrative embodiment thereof when read in conjunction with the accompanying drawing in which:

The figure is a perspective view of a heat exchange envelope constructed according to the invention.

In the drawing numeral 10 represents the passage walls of a heat exchanger that are spaced apart by closure bars 12 to provide passageways therebetween for the flow of a heating fluid and a fluid to be heated.

To increase the transfer of heat between opposite sides of the passage walls, extended surface means is provided on one or both sides thereof. In accordance with this invention the extended surface is presented in the form of a plane metallic sheet 18 having rows of similar apertures 22 formed therein by punching, the material from said apertures is bent normal to the plane of sheet 18 to provide fins 24 attached to the sheet adjacent one side of each aperture. The opposite or free ends of the fins that lie remote from sheet 18 are adapted to lie in substantially the same plane so as to provide an even base for contact with an adjacent plate 10. In order that the fins 24 may be held in permanent contact with plate 10 the ends of the fins are bonded to the plate by any satisfactory process such as brazing, welding, or the use of a ceramic adhesive.

Such a plate 10 with integral finned sheet 18 thus becomes a basic extended surface unit for assembly into a plate type heat exchanger of the type defined.

In assembly a series of plates 10 with integral fin sheets 18 are spaced apart by closure bars 12 to provide an envelope enclosing a passageway for a first fluid. The space 28 between side walls of adjacent envelope assem-

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[Price 3s. 6d.]

blies is similarly enclosed on a pair of opposite sides by other closure bars to provide an enclosed passageway for the flow of a second fluid therethrough. A series of such envelope  
5 assemblies so joined together thereby provides a series of independent passageways through alternate ones of which one fluid may flow in heat exchange relation with the fluid in the intermediate passages.

10 Other extended surface means including finned sheets 18 made to predetermined standards may be placed in the inner envelope spaces by attaching to the adjacent walls thereof, and numerous other changes may also be  
15 made without departing from the spirit of the invention. It is therefore intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting  
20 sense.

WHAT WE CLAIM IS:—

1. An extended surface element for the wall  
25 of a heat exchange passage comprising an apertured plate lying in a plane spaced from and substantially parallel to said passage wall, and rows of fins depending from said plate fixed to said passage wall to transfer heat between opposite sides thereof.

2. An extended surface element according  
30 to claim 1, characterized in that each fin is formed of material punched from the plate

to form an aperture and is attached at one end to the plate adjacent one side of the aperture, the opposite end of each fin being  
35 bonded to said passage wall.

3. An extended surface element according to claim 2, characterized in that said plate is  
40 metallic and formed with rows of apertures having the material therefrom bent out from the surface of the plate to form said rows of fins.

4. An extended surface element according to claim 3, characterized in that the material  
45 is bent normal to the plate to form said rows of fins.

5. An extended surface element according to any one of the preceding claims, characterized  
50 in that it is adapted for insertion in a heat exchange passage of a heat exchanger envelope adapted to transfer heat between two confined fluids, the walls of said passage being spaced apart by closure bars along one pair of opposite edges thereof.

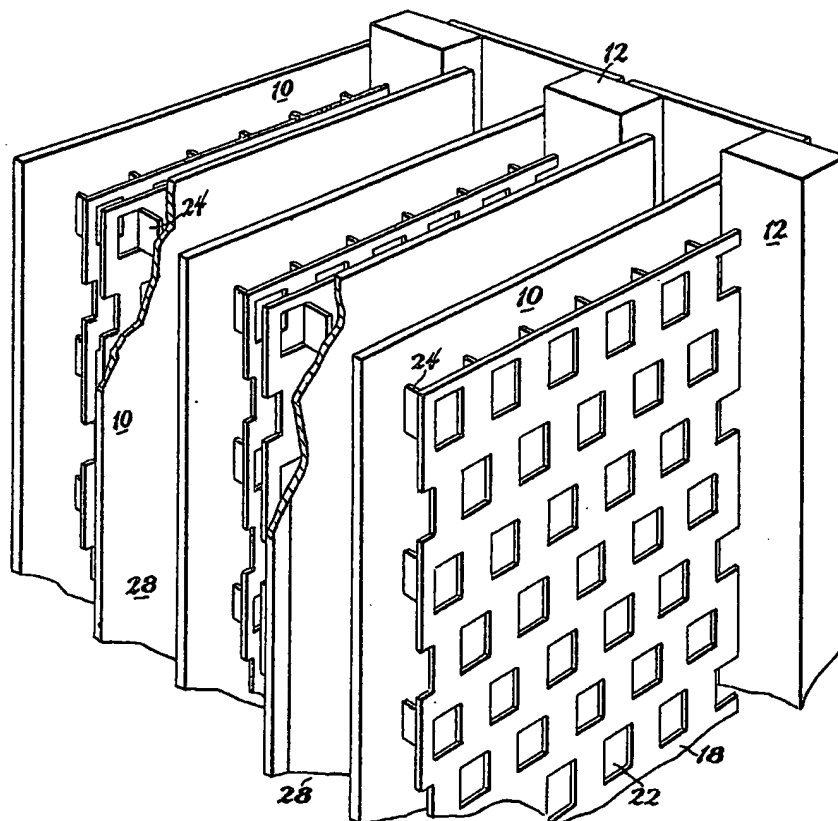
6. An extended surface element substantially  
55 as described herein and with reference to the accompanying drawing.

7. A heat exchanger envelope having an extended surface element substantially as described herein and with reference to the accompanying drawing.  
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MARKS & CLERK.

## COMPLETE SPECIFICATION

**This drawing is a reproduction of  
the Original on a reduced scale.**





Application No: GB 0004244.0  
Claims searched: 1 to 19

Examiner: T P Marlow  
Date of search: 23 May 2000

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): F4S: (S4G) (S4X)

Int Cl (Ed.7): F28F: 3/00, 3/02, 3/04, 3/08, 3/12

Other: ONLINE: WPI, EPODOC, JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2328275 A CHART MARSTON - see especially figure 2 showing lands (23) between flow passages (21), vents (22) in ribs enabling flow between slots (21)	1-7, 9-18

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
V	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.